



## The Millimetron Space Observatory

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Future FIR and Submm space observatories are an urgency to make progress in our understanding of key questions in modern astrophysics. As a next step we plan to develop and launch the Millimetron Space Observatory (MSO) that comprises a 10-m cryogenically cooled telescope, to be deployed in space. The initial orbit will be around the L2 position of the Sun-Earth system. At a later stage it will go into a highly elliptical orbit.

The MSO will operate as a single dish with high-resolution imaging and spectroscopy but also as an interferometer element in a Space-Earth VLBI regime and as such will open up new horizons of astrophysics with unprecedented sub-microarcsecond angular resolution. The MSO will be launched at ambient temperatures and cooled down in orbit through a combination of passive and active cooling using on-board mechanical coolers. This provides cooling of the 10-m space telescope to temperatures below 10K, with 5 K as a goal, and thus reduce by five orders of magnitude the thermal background emission from the entrance optics.

The MSO instruments will include FIR polarimetric cameras and spectrometers, a THz heterodyne instrument and dedicated mm/submm receivers for the Space-Earth interferometry. These will provide the MSO capabilities that allow investigations of the coldest and most distant objects in the Universe as well as studies of nearby star and planet forming regions, with unrivaled spectroscopic and angular detail and sensitivity.

The MSO is a Russian-led mission with an extensive international consortium. The launch is foreseen for 2029. We will present an overview and progress in the development of the payload module and a summary of the key scientific objectives that are under study for both observing modes: Space-Earth VLBI and Single Dish.